United States Patent [19]

Dunkin

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[54] **KNIFE SHARPENING DEVICE**

[76] Inventor: **Albert Dunkin**, 15 Ellsworth St., Bridgeport, Conn. 06605

[21] Appl. No.: **836,847**

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[51] **Int. Cl.**[4] **B24B 3/54**

[52] **U.S. Cl.** **51/128**; 51/116; 51/354; 76/82; 76/87; 76/88

[58] **Field of Search** 51/128, 116, 354, 210, 51/208, 214, 285, 111, 113, 114; 76/82, 87, 86, 83, 82.2, 88

[56] **References Cited**

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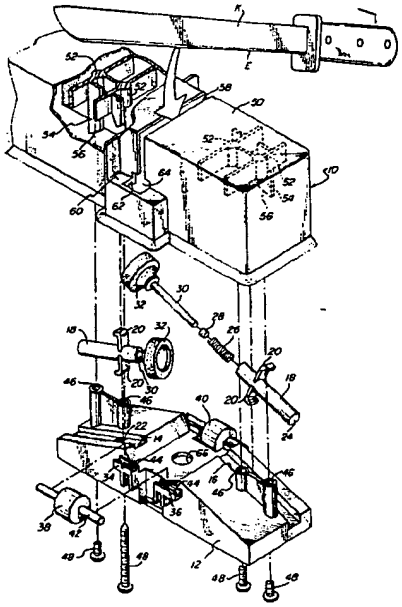
Primary Examiner—Frederick R. Schmidt
Assistant Examiner—Robert A. Rose
Attorney, Agent, or Firm—Kramer and Brufsky

[57] **ABSTRACT**

A knife sharpening device having a base removably supporting a pair of grinding wheels at an acute angle to the horizontal. A housing encloses the base and includes a slot for receiving a knife edge, which when inserted in the housing will seat between the wheels. The wheels are biased into clamping engagement with the knife edge so that to and fro movement in the slot will cause the wheels to contact and grind the edge of the knife.

11 Claims, 6 Drawing Figures



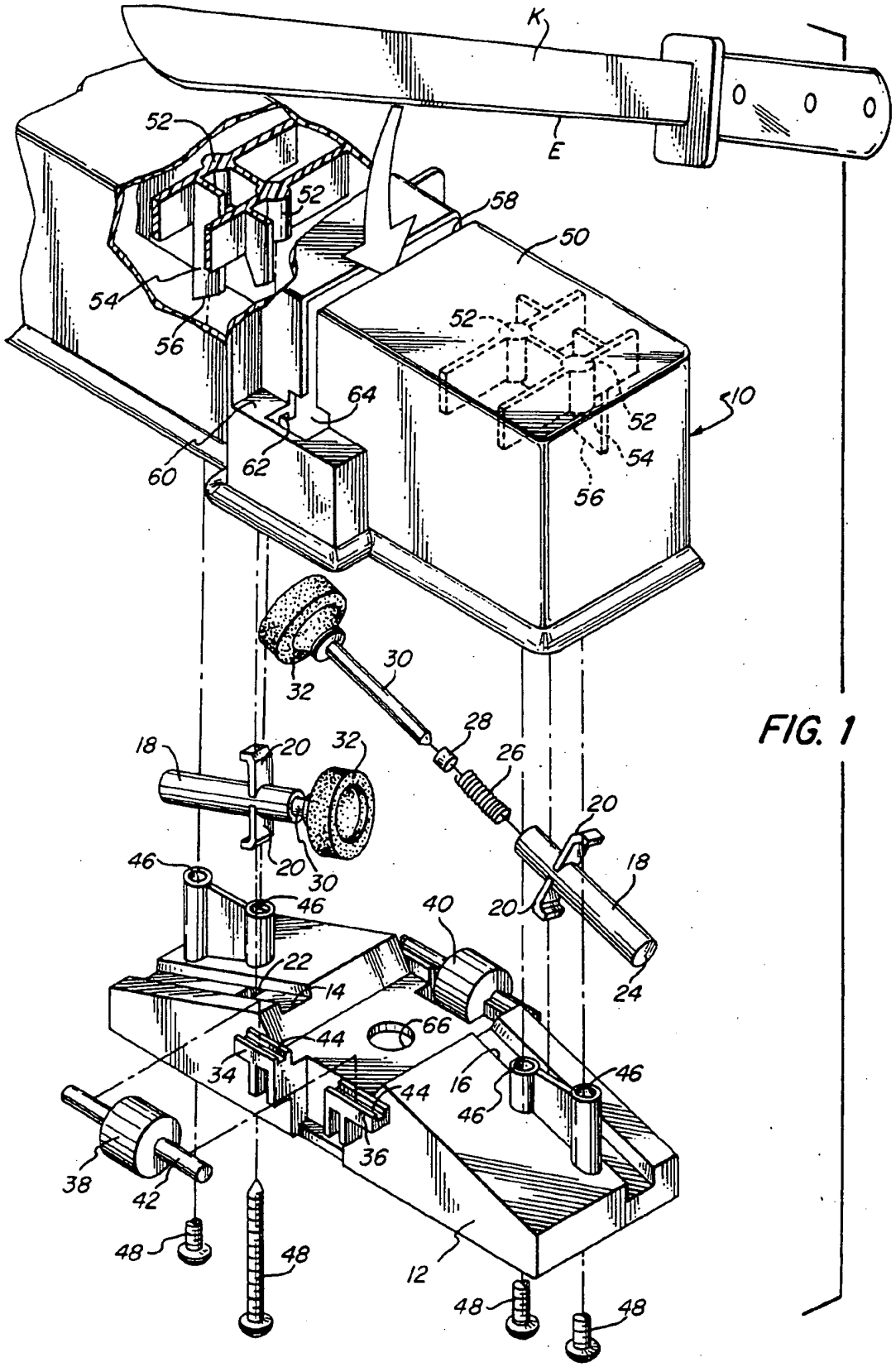

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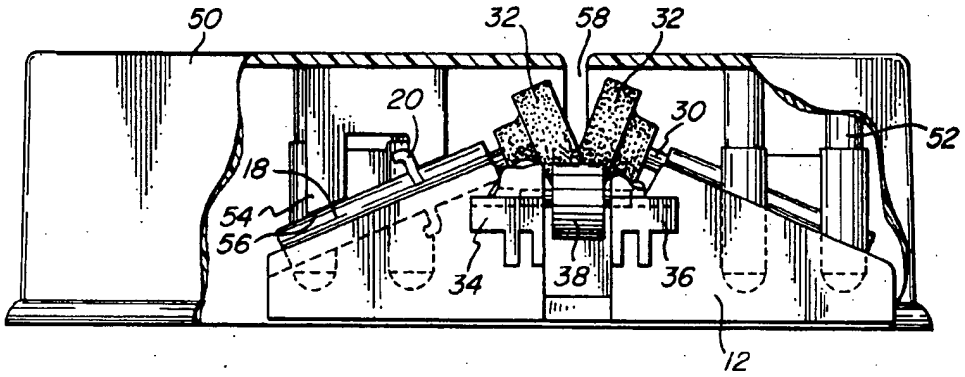
FIG. 1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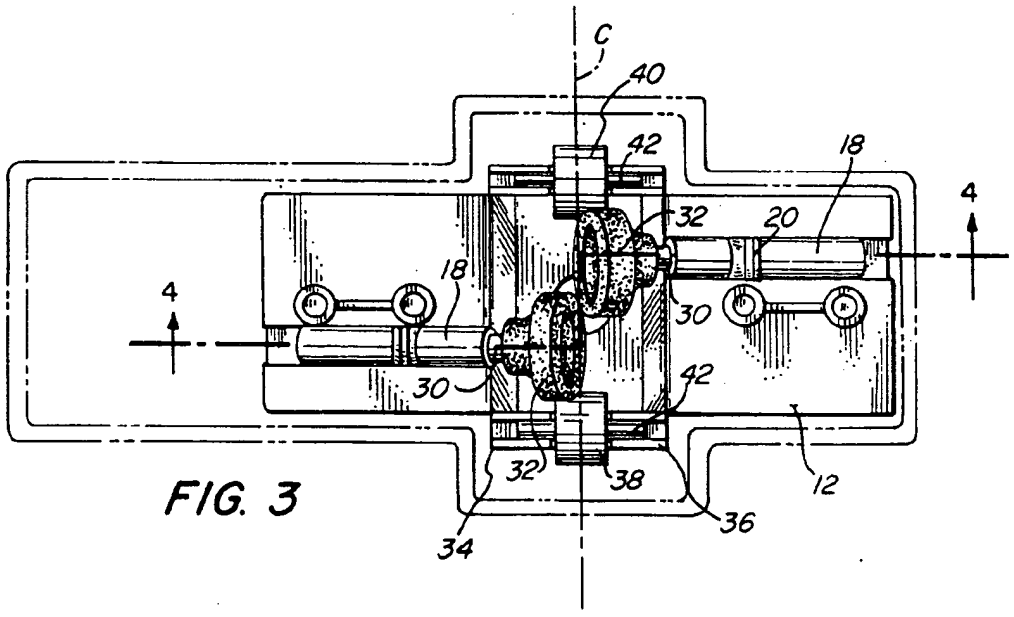
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FIG. 3

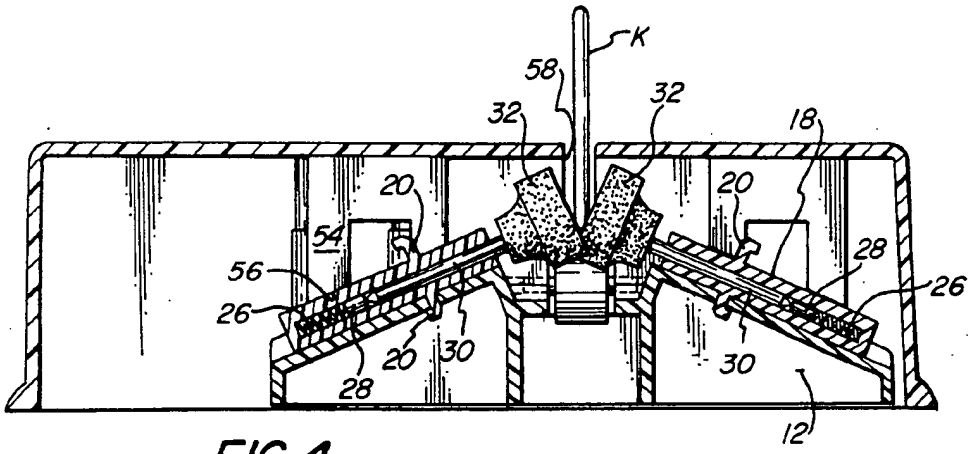

FIG. 4

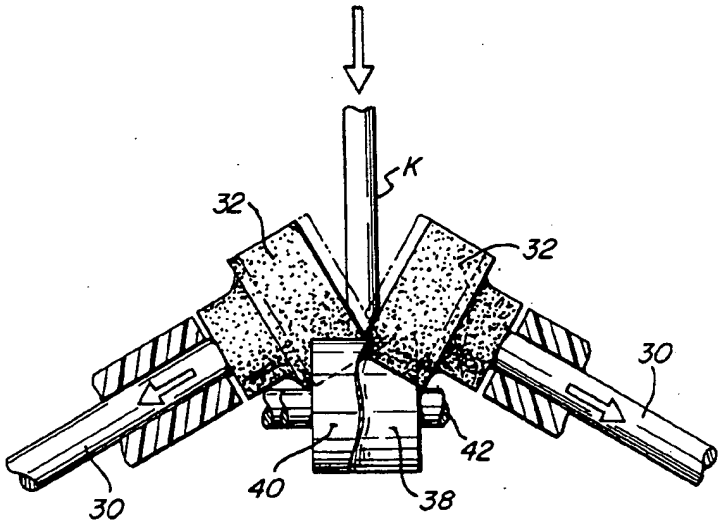

FIG. 5

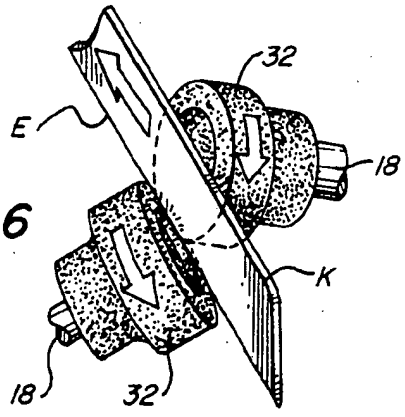

FIG. 6

KNIFE SHARPENING DEVICE

BACKGROUND AND SUMMARY OF THE INVENTION

This invention relates to a grinding apparatus, and more particularly, a kitchen-type appliance for grinding a knife edge to sharpen the same.

Knife sharpening devices have been known and used heretofore. Such devices are usually manufactured with non-replaceable parts. Accordingly, should the grinding or sharpening elements become worn, and they will after extended use, the device will no longer perform its function and must be thrown away and replaced. The knife sharpening device of the present invention provides another option.

In accordance with the construction of the present invention, a pair of grinding wheels are provided beneath a slot in the device housing which receives the edge of a knife to be sharpened. Each grinding wheel is connected to a shaft or spindle housed within a tube. A coil spring bears against the end of the shaft or spindle of the grinding wheel and biases it forwardly towards the other grinding wheel which is similarly supported at an inclined angle to the horizontal beneath the knife receiving slot. As the knife passes through the slot, it will contact each of the inclined faces of the side-by-side grinding wheels, causing each wheel to move rearwardly against the bias of the coil spring in its tube. When the knife edge is appropriately seated between the wheels, whose circumferences are designed to overlap slightly when extended, the knife edge will be firmly clamped between each of the grinding wheels. Backward and forward motion through the transversely slot across the axis of each grinding wheel spindle will cause the grinding wheels to rotate at an angle against the lower edge of the knife to grind and sharpen the same.

A roller can be located on opposite sides of the grinding wheels for providing a friction-free surface upon which the knife edge being sharpened can be readily slid in the slot relative to the grinding wheels.

The grinding wheel shafts or spindles are housed within a tube which is replaceably supported on the inclined surface of a support block encased within a substantially rectangular parallelopiped housing. The housing is threadably fastened to the support block and includes downwardly extending portions which contact each of the spindle receiving tubes to firmly lock the tube in place on the support block. Upon disassembly of the housing and support block, by removal of the threaded fasteners, each of the spindle receiving tubes can be removed from the support block along with each grinding wheel. The grinding wheels can then be removed from their support tubes and replaced and the entire assembly then reconnected, with the replacement parts readily intact.

BRIEF DESCRIPTION OF THE DRAWINGS

Further objects and advantages of the present invention will become apparent from the following description and claims, and from the accompanying drawings, wherein:

FIG. 1 is an exploded perspective view of the knife sharpening device of the present invention further illustrating how a knife is brought into contact with the grinding or sharpening elements thereof;

FIG. 2 is a side view in elevation of the knife sharpening device of FIG. 1 with portions removed to illustrate the components thereof;

FIG. 3 is a top plan view of the support block and grinding wheel elements for sharpening a knife edge seated thereon with the outer housing or case illustrated in phantom lines;

FIG. 4 is a cross-sectional view taken substantially on the plane indicated by line 4—4 of FIG. 3;

FIG. 5 is an enlarged view of the central portion of FIG. 4 illustrating the manner in which the knife edge to be sharpened interacts with the grinding rollers of the present invention to sharpen the knife edge; and

FIG. 6 is a perspective view of the elements illustrated in FIG. 5.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings in detail, wherein like numerals indicate like elements throughout the several views, the knife sharpening device of the present invention is illustrated in FIG. 1 by the numeral 10.

The knife sharpening device 10 includes a grinding element support base 12 formed from plastic material and provided with a pair of grooves 14 and 16. Each of the grooves 14, 16 are offset laterally with respect to the longitudinal axis of the support base 12 and receives therein a grinding wheel spindle or shaft support tube 18. Each of the grooves 14, 16 are disposed at approximately a $22\frac{1}{2}°$ angle to the horizontal plane of the lower edges of support base 12. Each of the tubes 18 includes an L-shaped wing-like member 20 extending above and below the longitudinal axis of each of the tubes 18. One of the L-shaped wing-like members 20 can be received in and through an aperture 22 to loosely mount one of the tubes 18 within its respective groove 14, 16. Each of the tubes 18 can be readily removed from aperture 22 by simply canting or tilting the tube 18 about its longitudinal axis in order to manipulate the shorter leg of the L-shaped wing-like member 20 out of the slot 22. Similarly, the tube can be mounted in the groove 14, 16 by manipulating the shorter leg of one of the L-shaped wing-like members 20 so that it passes through the aperture and beneath the hollow support base 12 as illustrated more clearly in FIG. 4.

Each of the tubes 18, which are closed at a distal end 24, includes a coil spring 26, a spacer element 28 which has a smaller diameter than tube 18, and a spindle or shank 30 connected at its near end to a grinding wheel 32. Grinding wheel 32 can be made from an abrasive material such as aluminum oxide. Each of the springs 26 in each tube 18 biases spacer 28 into contact with shank 30 to push the shank 30 and its associated grinding wheel 32 outwardly towards the other grinding wheel. As shown more clearly in FIGS. 2, 4, 5 and 6, the grinding wheels 30 normally occupy an inclined position where their circumferences overlap a center line C therebetween.

Also received on support base 12 between a pair of support brackets 34, 36 provided on opposite sides of support base 12, are a pair of rollers 38, 40. Each of the rollers 38, 40 has a shaft 42 rotatably mounted in a slot 44 in each of the brackets 34, 36 for rotation therein.

A pair of upright flutes 46 are provided on both sides of the centerline C of support base 12 which receive threaded fasteners 48 to connect base 12 to a substantially rectangular parallelopiped case or housing 50. Threaded fasteners 48 are received in integral nut ele-

ments 52 extending downwardly from the interior of the top portion of case 50. Also extending downwardly from the top portion of case 50 are clamp members 54, each having a lower beveled edge 56 adapted to contact one of the tubes 18 to clamp the tube 18 firmly in its respective groove 14, 16 when the support base 12 is threadably fastened to case 50.

Case 50 is also provided with an elongated slot 58 opening along three sides of the case and coinciding with the centerline C of support base 12 which extends between grinding rollers 32. As shown in FIGS. 4, 5 and 6, a knife K having an elongated cutting edge E to be sharpened, can be inserted in slot 58 and moved downwardly until it contacts the surface of each of the rollers 38, 40. As it is moved downwardly into contact with the rollers 38, 40, it contacts the outer grinding surfaces of each wheel 32 and pushes each wheel away from each other and centerline C against the bias of springs 26 in each tube 18. When the knife comes to rest on each of the rollers 38, 40, the grinding rollers 32 will thus be moved away from each other so as to exert a clamping action on the knife blade. As shown in FIG. 6, the blade of knife K can be then moved backwards and forwards along rollers 38, 40 in slot 58 causing concommitant rotation of each of the rollers 32 which will grind the knife edge E as they rotate. Since the rollers 32 are disposed at an angle with respect to knife edge E, the edge E will be readily ground through the removal of material along edge E. Material removed from the edge can fall through a hole 66 in base 12 or water flowing through slots 58 to wash the parts may exit through hole 66.

The rollers 38, 40 should be supported at an appropriate elevation with respect to the grinding rollers 32 so that when the knife edge E strikes and is seated on each of the rollers 38, 40, there is sufficient clamping pressure exerted by the rollers on the knife edge to effect grinding of the same. Further, if the rollers are mounted too low relative to the grinding wheels, the grinding action of the rollers will take place not at an angle but in a plane approaching that which is parallel to the knife edge E so that a minimal amount of grinding takes place. Ideally, when a knife blade B is inserted in slot 58 and seated on rollers 38, 40 between grinding wheels 32, the edge E should contact the circumference of each wheel at a point on the circumference at angle of about 30° to 60° to the centerline C of base 12 passing through the center of each wheel 32.

Should the grinding wheels 32 become worn, they can be readily replaced by simply unthreading fasteners 48 to separate the support base 12 from case 50 and then removing each tube 18 and replacing roller 32 and its shank 30 within the tube. The same is true upon wear of each of the rollers 38, 40 which merely have to be lifted upwardly from its support slots 44 in brackets 34, 36. The outer surface of case 50 is provided with complementary brackets 60 having downwardly facing slots 62. The brackets 60 align and cover each slot 44 near bracket 34, 36 to clamp the roller shafts 42 between the upwardly facing slots 44 and downwardly facing slots 62 to preclude their removal while permitting rotation thereof. Each of the rollers 38, 40 will extend upwardly through an opening or cut out portion 64 provided within the case at the end of the side portions of slot 58 extending into the top of bracket 60.

In order to promote even wear of the grinding wheels 32, each wheel is provided with a concentric recess spaced from its circumference. This will substantially preclude high points from forming on the narrow circumference, which may result in marring the blade B by grinding or pitting the blade when it contacts the high point.

During use, the case 50 can be grasped with one hand while the knife K is held in the other and inserted within slot 58. Then, the knife edge E is moved backward and forward against the grinding surfaces of rollers 32 on rollers 38, 40 while the case 50 is held with the opposite hand to effect sharpening of edge E.

What is claimed is new is:

1. Knife sharpening apparatus comprising:
a base having a longitudinal axis and having a pair of grooves on its top surface each on opposite sides of the longitudinal axis of said base, each groove being disposed on said surface at an acute angle to the horizontal,
a first and second means on said base each supporting a grinding wheel at an acute angle to the horizontal on opposite sides of the longitudinal axis of said base, each means including
an elongated tube having an open end and a closed distal end,
a shaft connected to said grinding wheel received in said open end of said elongated tube, and
a coil spring between the end of said shaft and said closed distal end of said tube for biasing said shaft away from said closed distal end of said elongated tube,
roller means mounted on opposite sides of said base on opposite sides of the longitudinal axis thereof whose mid-portion is substantially coincident with a centerline through said base substantially perpendicular to the longitudinal axis thereof,
First and second grinding wheels mounted respectively in said first and second support means having an abrasive surface extending toward each other and having a portion of the circumference thereof extending beyond the center-line of said base,
means for removably connecting each of said elongated tubes to said base in seated arrangement in said grooves.

2. The apparatus of claim 1, including:
a housing removably connected to said base, said housing including
an elongated slot for receiving the blade of a knife, said elongated slot opening in a plane coincident with the centerline of said base so that a knife inserted in said elongated slot can have an edge to be sharpened seated on said roller means between said first and second grinding wheels.

3. The apparatus of claim 1 wherein said removable connecting means includes a substantially L-shaped wing member on each support tube received through an aperture in said base in each of said slots.

4. The apparatus of claim 3 including
a pair of spaced brackets mounted on opposite sides of said base, each bracket having a upwardly opening slot for receiving a shaft of said roller means.

5. The apparatus of claim 3 wherein said housing includes
means for clamping each support tube to said base upon connection of said housing to said base.

6. The apparatus of claim 5 wherein said clamping means includes a downwardly extending member on the interior of said housing having a beveled edge for contacting the exterior of said tube.

7. The apparatus of claim 4 wherein said housing includes a pair of spaced brackets on opposite sides of said housing, each of said brackets having a pair of spaced down-wardly opening slots adapted to overlie one of the upwardly opening slots in said base brackets to clamp a shafat of said roller means therebetween.

8. The apparatus of claim 5 wherein said housing is removably connected to said base by threaded fasteners received through flutes extending between said base and housing, each fastener being secured to a nut on the interior top surface of said housing.

9. The apparatus of claim 1 wherein the abrasive surface on each of said grinding wheels has a concentric recess spaced from the outer circumference thereof.

10. Knife sharpening apparatus comprising:

a base having a longitudinal axis and having a pair of grooves on its top surface each on opposite sides of the longitudinal axis of said base, each groove being disposed on said surface at an acute angle to the horizontal,

a first and second means on said base each supporting a grinding wheel at an acute angle to the horizontal on opposite sides of the longitudinal axis of said base, each means including

an elongated tube having an open end and a closed distal end,

a shaft connected to said grinding wheel received in said open end of said elongated tube, and

a coil spring between the end of said shaft and said closed distal end of said tube for biasing said shaft away from said closed distal end of said elongated tube,

roller means mounted on opposite sides of said base on opposite sides of the longitudinal axis thereof whose mid-portion is substantially coincident with a centerline through said base substantially perpendicular to the longitudinal axis thereof,

first and second grinding wheels mounted respectively in said first and second support means having an abrasive surface extending toward each other and having a portion of the circumference thereof extending beyond the centerline of said base,

a spacer element inserted into said elongated tube between said coil spring and said shaft connected to said grinding wheel such that said coil biases said spacer into contact with said shaft.

11. Knife sharpening apparatus comprising:

a base having a longitudinal axis and having a pair of grooves on its top surface each on opposite sides of the longitudinal axis of said base, each groove being disposed on said surface at an acute angle to the horizontal,

a first and second means on said base each supporting a grinding wheel at an acute angle to the horizontal on opposite sides of the longitudinal axis of said base, each means including

roller means mounted on opposite sides of said base relative said grinding wheel so that when a knife blade is seated on said roller means between said grinding wheels, it will contact said grinding wheels at a point on the circumference thereof at an angle approximately 30° to 60° of the centerline of said base passing through the center of each wheel,

first and second grinding wheels mounted respectively in said first and second support means having an abrasive surface extending toward each other and having a portion of the circumference thereof extending beyond the centerline of said base, and

means associated with said first and second support means for biasing each grinding wheel toward the other grinding wheel.

* * * * *

United States Patent [19]

Miyamoto

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[11] 3,889,425

[45] June 17, 1975

[54] **MICROTOME KNIFE SHARPENING MACHINE**

[76] Inventor: **Naomichi Miyamoto**, 75-5, Oaza-Imojiya, Koshoku-shi, Nagano-ken, Japan

[22] Filed: **Aug. 14, 1974**

[21] Appl. No.: **497,502**

[30] **Foreign Application Priority Data**

Aug. 15, 1973 Japan 48-95876
Aug. 15, 1973 Japan 48-95877

[52] **U.S. Cl.** ..... **51/56**; 51/109 BS; 51/125.5
[51] **Int. Cl.** **B24b 7/00**; B24b 9/00
[58] **Field of Search** ..... 51/54, 56, 109 R, 109 BS, 51/125, 125.5

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Primary Examiner—Othell M. Simpson
Attorney, Agent, or Firm—Eric H. Waters

[57] **ABSTRACT**

A microtome knife sharpening machine comprises a grinding wheel and a microtome knife carrying assembly which is pivotally supported on a support in a manner such that a microtome knife held by the carrying assembly may be swung toward and away from the grinding surface of the grinding wheel. The support has a rod extending outwardly from the support and constituting a pivot shaft of said carrying assembly, which pivot shaft is rigidly connected with the carrying assembly so that when the rod is manually turned the carrying assembly is swung. The rod is enclosed in a sleeve which is slidable relative to the rod but is unable to rotate relative to the same. The sleeve is urged axially inward by a spring and has a radial arm formed with an engaging peg, which is engageable selectively with one of a plurality of engaging depressions formed in the support so that by pulling the sleeve axially outwardly, and thereafter turning and releasing the same, the microtome knife carrier assembly can be locked in one of a plurality of angular positions with respect to its pivot axis.

8 Claims, 11 Drawing Figures

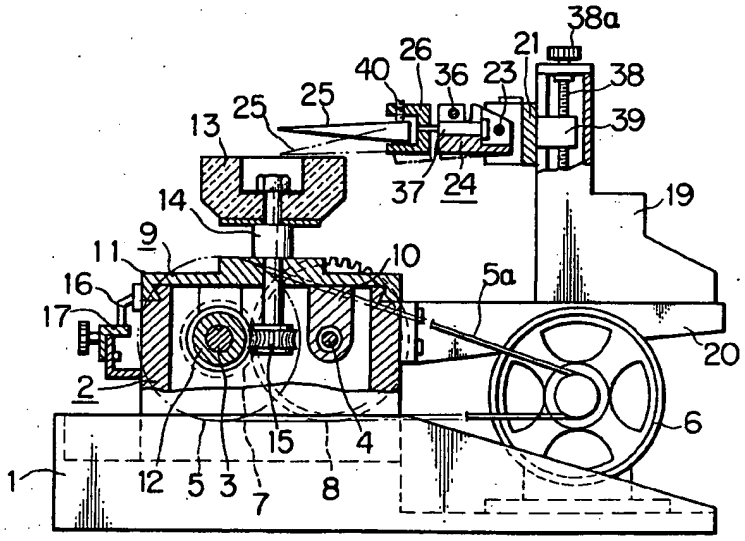


FIG. 1

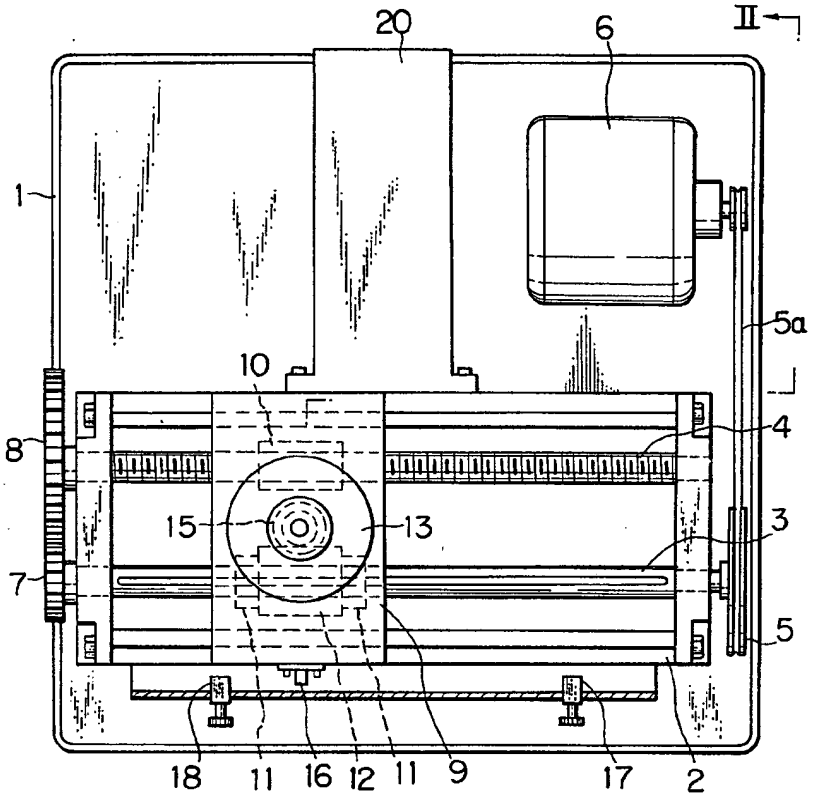


FIG. 2

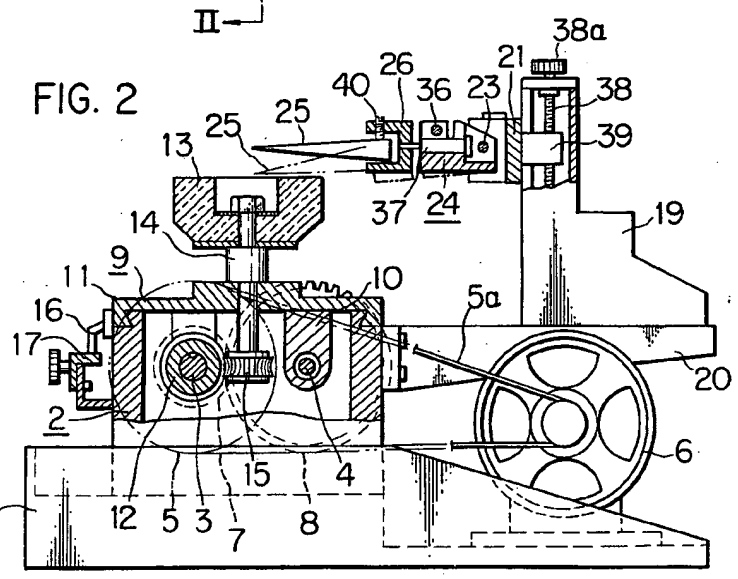


FIG. 3

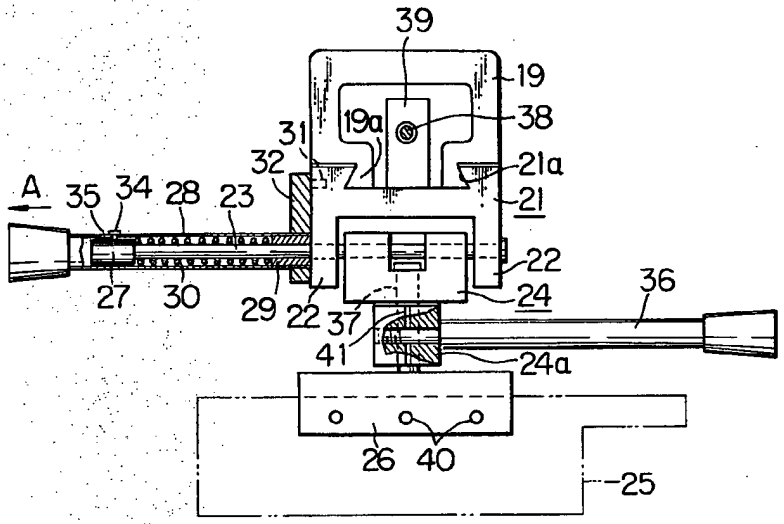


FIG. 4

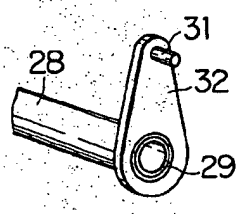


FIG. 5

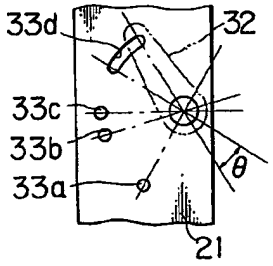


FIG. 6

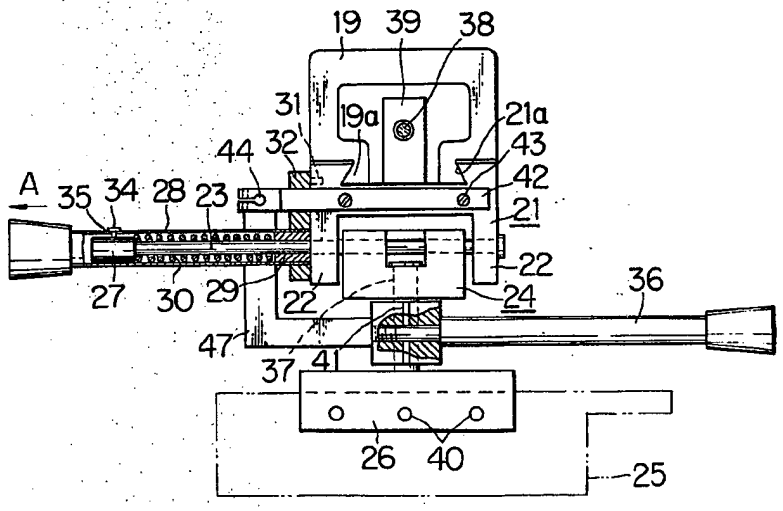


FIG. 7

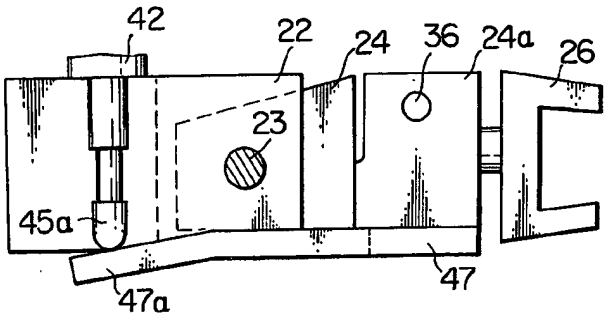


FIG. 8

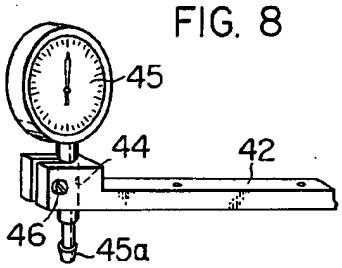


FIG. 9

FIG. 10

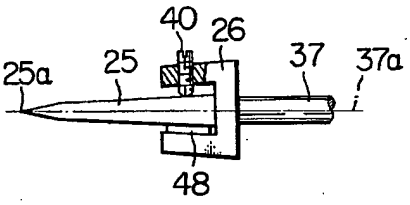
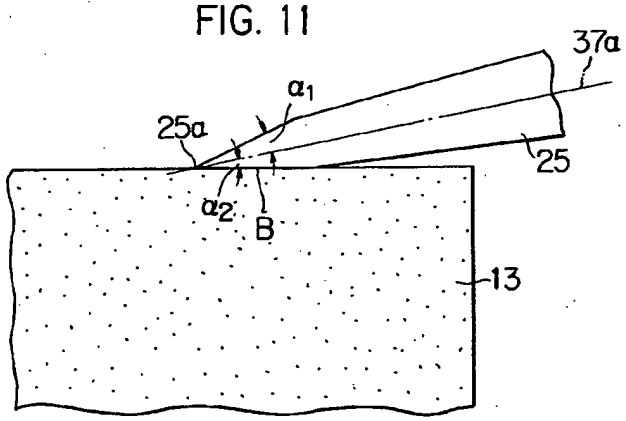


FIG. 11



MICROTOME KNIFE SHARPENING MACHINE

BACKGROUND OF THE INVENTION

The present invention relates in general to grinding machines, and more particularly to a machine adapted to grind knives of a microtome device which is specifically used for preparation of organic tissue specimens for microscopic investigations to an extra thin thickness required therefor. More specifically, this invention is conerned with improvements in a microtome knife sharpening machine including a specific supporting assembly for holding a microtome knife in angular relationship with respect to the grinding surface of a grinding wheel incorporated therein for sharpening microtome knives.

In consideration of the fact that a knife for a microtome device is specifically used for cutting processed organic tissue blocks for a microscopic investigation to such a thickness of the order ranging from 1 to 2 microns, and in addition, thus obtained specimens for microscopy should have as little deviation as possible from a predetermined cutting thickness, it is essential that such grinding or sharpening operation should be preformed with extremely high precision.

In general, such a sharpening machine known heretofore has been relatively complex in construction, and inevitably difficult or very delicate in its handling operation. Above all, since the supporting means for such a microtome knife of the above stated character should be precise in the angular setting and securing of the microtome knife with respect to the grinding surface as a reference surface in the grinding operation, it has generally been considerably troublesome and difficult to adjust such operating factors of the knife with respect to the grinding surface of the grinding wheel as angular setting, levelling, vertical positioning, etc. of the microtome knife, and to turn over the microtome knife in a proper condition from a state in which one edge surface of the knife contacts the grinding wheel to a state in which the opposite edge surface contacts the grinding wheel.

SUMMARY OF THE INVENTION

It is therefore a primary object of this invention to provide an improved microtome knife sharpening machine which greatly facilitates several operations relating to the edge sharpening operation in a microtome knife sharpening machine.

It is another object of this invention to provide an improved microtome knife sharpening machine which includes an angularly adjustable supporting assembly for the microtome knife so that the microtome knife may selectively take a plurality of angular positions for facilitating such steps relating to the sharpening operation as overturning, replacement, checks, and hand correction work of the microtome knife in addition to the edge sharpening operation.

It is a further object of this invention to provide an improved microtome knife sharpening machine which affords provision of a relieved position of the microtome knife for the edge sharpening operation thereof, wherein the microtome knife is kept in a suitable angular position within a given angular range with respect to the grinding surface of the grinding wheel so that the knife may freely press under its own weight on the grinding surface at an optimum grinding angle.

It is a still further object of this invention to provide an improved microtome knife sharpening machine which affords as a secondary effect a self-dressing function of the grinding wheel during the edge sharpening operation.

It is a still further object of this invention to provide an improved microtome knife sharpening machine which affords visual and exact indication of fine movements of the microtome knife during the edge sharpening operation in terms of unit dimension by using a dial indicator incorporated therein.

According to this invention, briefly summarized, there is provided an improved microtome knife sharpening machine of the type including a base structure, a grinding wheel rotatable about an axis and having a planar grinding surface, means for driving the grinding wheel in rotation, microtome knife carrier means, and support means mounted on the base structure to be swingable about pivot axis and supporting the microtome knife carrier means, whereby a microtome knife held by the carrier means is capable of being angularly adjusted with respect to the grinding surface, wherein there is provided an improvement which comprises rod means rotatably supported by the support means and being rotatable with the microtome knife carrier means about the pivot axis with respect to the support means, slidable means so mounted on the rod means that the same is not allowed to rotate relative to the rod means but is allowed to move axially relative to the rod means, first engaging means disposed on the slidable means, at least two second engaging means disposed on the base structure, the first engaging means being adapted to engage selectively with one of the second engaging means so as to enable the microtome knife means to take at least two angular positions selectively, and resilient means urging the slidable means and hence the first engaging means toward the second engaging means thereby to provide the tendency of the first engaging means moving into engagement with the second engaging means.

The nature, principle, and details of the present invention, as well as further objects and advantages thereof, will become more apparent from the following detailed description with respect to a preferred embodiment of the invention, when read in conjunction with the accompanying drawings, in which like parts are designated with like reference numerals.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. 1 is a plan view, with some parts removed for clarity, showing a grinding wheel arrangement of a microtome knife sharpening machine of this invention;

FIG. 2 is a side elevational view, partly in vertical section, showing the microtome knife sharpening machine shown in FIG. 1;

FIG. 3 is a top plan view, partly in section and on an enlarged scale, showing a microtome knife support assembly of the sharpening machine shown in FIG. 2;

FIG. 4 is a fragmentary perspective view showing an end portion of a sleeve for angular adjustment of a microtome knife held by the support assembly of the sharpening machine;

FIG. 5 is a fragmentary view showing a reference wall surface with a plurality of depressions for angular adjustment of the microtome knife with respect to the grinding surface of a grinding wheel;

FIG. 6 is a top plan view, partly in section, showing a second example of the microtome knife support assembly;

FIG. 7 is an enlarged fragmentary side elevational view showing in detail the components of the microtome knife support assembly;

FIG. 8 is a fragmentary perspective view showing a dial gauge support arm of the microtome knife support assembly;

FIG. 9 is a perspective view showing a dial gauge operating strap of the microtome knife support assembly;

FIG. 10 is a fragmentary view, partly in section, showing the microtome knife held in a U-shaped knife holder of the microtome knife support assembly; and

FIG. 11 is a diagrammatic view showing a sharpening state of the microtome knife on the grinding surface of the grinding wheel.

DETAILED DESCRIPTION

Description will now be given on a preferred embodiment of a microtome knife sharpening machine according to this invention in conjunction with the accompanying drawings.

Referring first to FIGS. 1 and 2, there is shown a microtome knife sharpening machine of this invention which includes a base 1, a journal box 2 disposed on the front portion of the base 1, a driving shaft 3 extending between the lateral end plates of the journal box 2 having an elongated slot along the length thereof, and a threaded shaft 4 extending in parallel with the shaft 3 between the lateral end plates and adapted to lead a grinding wheel assembly through threaded connection therewith, in both rightward and leftward directions as viewed in FIG. 1. On the shaft 3, there is secured a belt pulley 5 at the rightmost end thereof as viewed in FIG. 1, and a belt 5*a* is passed around the pulley 5 and a driving pulley on the output shaft of an electric motor 6. The above mentioned two shafts 3 and 4 are interconnected with each other by means of gears 7 and 8 secured to the shafts 3 and 4, respectively, so that the both shafts 3 and 4 are driven concurrently by the motor 6.

There is further provided a grinding wheel mount 9 on the upper surface of the journal box 2, which mount is slidable in rightward and leftward directions as viewed in FIG. 1 in parallel with the above mentioned two shafts 3 and 4. The mount 9 has a projection 10 extending downwardly for thread engagement with the screw threads on the shaft 4 and a pair of spaced apart projections 11 disposed respectively in sliding contact with axial end faces of a worm 12 mounted rotatably with and axially slidably on the shaft 3 through a slide key provided radially in the central bore of the worm.

A grinding wheel 13 is secured to a vertical shaft 14 journaled in the mount 9, and to the lower end of the shaft 14, a worm wheel 15 is secured for engagement with the worm 12. Consequently, when the shafts 3 and 4 are driven in rotation by the motor 6, the grinding wheel mount 9 is caused to move along the shafts 3 and 4, while the grinding wheel 13 is caused to be driven in rotation through the worm wheel 15.

There is provided an electric switching arrangement for periodically changing the direction of rotation of the motor 6 and hence the direction of travel of the grinding wheel mount 9 along the shaft 3. A dog 16 is disposed on the front side of the mount 9 and alternately hit against limit switches 17 and 18 disposed in positions corresponding to the extreme points of the reciprocating travelling of the mount 9, so that the electric circuit for the motor 6 is changed-over and the direction of rotation thereof is reversed periodically. By this change-over operation, the grinding wheel mount 9 is caused to be moved on the journal box 2 in a reciprocating manner, while the grinding wheel 13 thereon is driven in rotation.

In FIG. 2, there is shown a stand 19 which is supported slidably on a bracket 20, the bracket extending laterally from the journal box 2 as viewed in FIG. 2, so that the stand 19 may be adjusted in its position relative to the grinding wheel 13. Further, there is mounted a microtome knife support member 21 on one side of the stand 19 in vertically slidable relationship therewith, by means of a dovetail tenon 19*a* (FIG. 3) of the stand 19 and a dovetail groove 21*a* provided in the vertical side of the stand 19 remote from the grinding wheel and engaging the tenon 19*a*, for permitting vertical movement of the microtome knife support member 21 with respect to the stand 19. There is provided a threaded rod 38 for thread engagement with a projection 39 extending from the support member 21 into the hollow interior of the stand 19, which threaded rod is designed for adjusting the vertical level of the support member 21 and is provided with a knob 38*a* at the top thereof for enabling manual turning thereof.

Now, referring to FIG. 3, the microtome knife support member 21 includes two supporting walls 22 extending outwardly from the front fact thereof, and these supporting walls 22 support a horizontal rod 23 extending therethrough and projecting to the left from the support member 21 as viewed in FIG. 3 in such a manner that the rod 23 can be rotated manually to a desired angular position with respect to the support member 21. Between the supporting walls 22, there is a carrier block 24 secured rigidly on the rod 23 and having an integral clamping section 24*a* on the central portion of which clamping section a knife holder 26 of generally U-shaped cross section is provided for securing rigidly a microtome knife 25 in a proper position for knife sharpening operation by using set screws 40.

There is a enlarged diameter portion 27 on the free end of the rod 23, the portion 27 having an outer diameter permitting an adjusting sleeve 28 to be slidably fitted thereonto. The sleeve 28 extends over the portion of the rod 23 projecting from the support member 21 in coaxial relationship therewith, and has a collar 29 rigidly secured to the inner wall thereof, the collar having a bore of a diameter to permit itself to be freely slid along the rod 23. Between the portion 27 and collar 29 there is interposed a compression coil spring 30, so that the spring may urge by its resilient force the collar 29 and thus the adjusting sleeve 28 against the support member 21. Since the adjusting sleeve 28 is slidably fitted on the portion 27 of the rod 23, the sleeve 28 may be moved manually in the axial direction.

In addition, there is provided an engaging arrangement comprising a pin 34 projecting radially outwardly from the enlarged diameter portion 27 and a slot 35 formed in the sleeve 28 in the lengthwise direction thereof and receiving the pin 34 therein so that the sleeve 28 can be manually moved in the axial direction without relative rotation thereof with respect to the rod 23. Also, there is an arm 32 provided rigidly with the sleeve 28 at the proximal end of the same and extending radially outwardly so as to selectively engage, by

means of a peg 31 projecting at the tip end thereof toward the support member 21 (see FIG. 4), with depressions 33*a*, 33*b*, 33*c*, and 33*d* formed in the lateral surface of the support member 21 in angularly spaced apart relationship along an arc of a circle having its center on the axis of the adjusting sleeve 28 or the rod 23 as shown in FIG. 5.

The above mentioned manual axial movement of the adjusting sleeve 28 with respect to the enlarged diameter portion 27 permits the peg 31 on the arm 32 to be disengaged from any one of the depressions 33*a*, 33*b*, 33*c*, and 33*d* for the purpose of angular adjustment of the microtome knife 25 held in the knife holder 26 in accordance with the angular positions of such depression. Among the depressions, the depression 33*d* is particularly of arcuate shape and extends over a certain angular range.

A clamping rod 36 is provided for releaseably securing the microtome knife holder 26 against rotating motion thereof with respect to the carrier block 24 about the axis of a shaft 37 extending integrally from the knife holder 26. The shaft 37 is rotatably fitted in the carrier block 24 and its clamping section 24*a*, and when the clamping rod 36 is manually turned in a tightening direction the shaft 37 is tightened and prevented from rotating. More specifically, the clamping section 24*a* formed integrally with the carrier block 24 is provided with a slit 41 cut along the shaft 37, and a screw-threaded tip end of the clamping rod 36 extends a portion thereof along an opening extending therethrough and adapted across the slit 41. Therefore, the slit 41 can be narrowed, by manually turning the clamping rod 36 in the tightening direction, so as to cause the knife holder 26 to be secured rigidly in a desired angular position. It will be understood that the microtome knife held by the holder 26 is prevented from accidental rotating movements with its one edge surface set in grinding contact with the grinding surface of the grinding wheel 13.

With the arrangement described above, when the adjusting sleeve 28 is manually pulled outwardly in the direction as indicated by arrow A in FIG. 3 and the peg 31 is disengaged from any of the depressions 33*a*, 33*b*, 33*c*, and 33*d* against the biasing force of the compressed spring 30, the adjusting sleeve 28 and the rod 23 are released and permitted to effect free angular movement, and, consequently, the carrier block 24 secured to the rod 23, and hence the knife 25 can now be ready for manual angular adjustment with respect to the axis of the rod 23. In this connection, it is now possible to cause the peg 31 to be releasably engaged with any other depressions.

For instance, when the peg 31 is manually selectively caused to engage with the depression 33a, the knife holder 26 is held in a position where the microtome knife 25 is at the angle of 60° above the horizontal plane, and this position is particularly suitable for the manual overturning of the microtome knife, after the sharpening operation is completed on one side thereof, to sharpen the edge of the reverse side. For this manual overturning operation, the clamping rod 36 is loosened by turning it in the untightening direction to cause the slit 41 of the clamping section 24*a* to be widened. As a result, the knife holder 26 with the microtome knife 25 is allowed to undergo rotating movement with respect to the axis of the shaft 37, and thus the overturning operation of the microtome knife can be performed easily without the necessity of detaching and then resetting the knife in position for the succeeding sharpening operation.

When the peg 31 is engaged with the depression 33*b* in the lateral side of the support member 21 after manually rotating the adjusting sleeve 28, the knife holder 26 takes a position 15° above the horizontal plane, which position is particularly provided for facilitating attachment or detachment of the microtome knife to and from the holder 26 before and after the sharpening operation. When the peg 31 is then set to engage with the depression 33*c*, it provides a horizontal position of the microtome knife wherein it is convenient to check the ground edge portion of the knife or to remove any burrs which are likely to be produced on the edge surface opposite to that surface just ground by the sharpening operation.

Now, when the peg 31 is set to engaged with the arcuate depression 33*d*, the knife holder 26 with the microtome knife 25 therein is kept in condition such that the microtome knife will swing within a range of angle θ with respect to the axis of the rod 23 so as to press on the grinding surface of the grinding wheel 13 with a force due to gravity. In this condition, the microtome knife undergoes grinding contact with the grinding surface with a degree of freedom allowing the knife to be swung about the pivot axis of the rod 23 under its own weight.

It should be noted that during sharpening operation of the microtome knife under this condition, the microtome knife is caused to press on the grinding surface of the grinding wheel 13 under its own weight while being relieved from any positive force to compel the knife edge surface against the grinding surface. On the other hand, the contact angle of the microtome knife formed between the microtome knife and the grinding surface of the grinding wheel during sharpening operation can be adjusted finely by manually turning the knob 38*a*, which is connected to the threaded rod 38 threadedly engaged with the projection 39 of the support member 21, to displace the member 21 vertically for adjustment of the microtome knife 25.

During the sharpening operation of the microtome knife by the grinding wheel of the machine, if the grinding surface of the grinding wheel 13 should not be definitely in parallel relationship with the edge surface of the microtome knife to be sharpened in the beginning stage of the operation, the grinding surface will wear-fit to the edge surface thereof as the grinding operation progresses, so that a self-dressing operation of the grinding wheel is effected.

With the above described improved microtome knife sharpening machine according to this invention, there are afforded various advantageous features. For example, it is practically possible to permit the microtome knife to be disposed selectively in one of several angular positions for convenience in such as the overturning step, checking step, and further hand correction steps for finishing procedure and the grinding position where the knife presses on the grinding surface of the grinding wheel within a given angular range. It is apparent that this provides considerable ease and convenience in the performance of the steps relating to the sharpening operation of the microtome knife. In FIGS. 6 through 11, there is shown a second example of the microtome knife support assembly according to this invention. Descriptions will now be given on only the differences of

the second example from the first one described hereinbefore. Referring to FIGS. 6 and 7, there is provided a support bar 42 for a dial indicator 45 to be located above the upper surface of the support member 21, the support bar being secured to the member 21 by set screws 43. This support 42 is provided with a slit 44 at the leftmost end thereof as viewed in FIGS. 6 and 8 for receiving the dial indicator therein and clamping it rigidly by a screw 46 (FIG. 8). Also, there is a L-shaped contact strap 47 (FIG. 9) attached to the lower surface of the clamping section 24*a* of the carrier block 24 at one end thereof. The other end 47*a* of the contact strap 47 is disposed adjacent the position where the dial indicator is, and is in contact with the sensing tip 45*a* of the indicator 45.

Since the microtome knives are designed with several thickness, the knife holder 26 has an extra width of the opening thereof so that a knife of any thickness may be held in position in the holder 26 through a shim 48 of a suitable thickness by using set screws 40 as shown in FIG. 10. In this procedure, the knife 25 must be secured in the holder 26 with its edge line definitely lying on the reference center line 37*a* of the knife holder shaft 37. This arrangement is of significance, since, otherwise, the angular relationship of the microtome knife edge surfaces would be unduly asymmetrical with respect to the grinding surface of the grinding wheel 13, or in other words, the bevel angles $\alpha 1$ and $\alpha 2$ defined by the edge surfaces C and B of the microtome knife with respect to the reference line 37*a* cannot be identical. The correct setting position of a microtome knife 25 held by the knife holder 26 with respect to the grinding surface of the grinding wheel 13 is shown in FIG. 11.

With the arrangement of the microtome knife support assembly of this example, wherein the dial indicator 45 is mounted with its sensing tip 45*a* abutting the tip end 47*a* of the contact strap 47 which is secured to the lower part of the carrier block 24, when the microtome knife 25 is set in position for sharpening operation on the grinding surface of the grinding wheel 13 with one edge surface B of the knife resting thereupon, the contact strap 47 can swingably move about the axis of the rod 23 together with the knife holder 26 set in the sharpening position as the knife edge sharpening operation is carried out by the grinding surface of the grinding wheel. Even if the swinging motion of the knife holder 26 is very small in extent, it is immediately transmitted to the sensing tip 45*a* of the dial indicator 45 by the contact strap 47 as best seen in FIG. 7, and thus the dial indicator indicates the extent of such motion in terms of unit dimensions on the dial. Consequently, when the microtome knife 25 is turned over from the state in which its edge surface B contacts the grinding wheel to the state in which the opposite edge surface C contacts the grinding wheel, and if the edge line of the knife does not coincide with the reference line 37*a* of the shaft 37, the dial indicator reading will differ from the previous reading, indicating the amount of angular deviation in terms of unit dimensions on the dial. Thus, improper angular setting of the knife can be corrected. Through such dial reading, it can be determined how much dimensional compensation should be taken, whereby it is possible to replace the shim by another shim of a proper thickness, and this affords an optimum setting of the microtome knife 25 with respect to the grinding surface of the grinding wheel.

As described hereinabove, with the dial indicator incorporated in the knife support assembly of the microtome knife sharpening machine, it becomes possible to determine exactly whether or not the microtome knife 25 is properly positioned with respect to the reference center line of the knife holder 26, and consequently, the grinding angles $\alpha 1$ and $\alpha 2$ defined by the edge surfaces of the knife can be definitely equalized. This means that the machine according to this invention can carry out edge sharpening operation of microtome knives with ease and high prescision.

I claim:

1. In a microtome knife sharpening machine comprising a base structure, a grinding wheel rotatable about an axis and having a planar grinding surface, means for driving said grinding wheel in rotation, microtome knife carrier means, and support means mounted on said base structure to be swingable about a pivot axis and supporting said knife carrier means, whereby a microtome knife held by the carrier means is capable of being angularly adjustable with respect to said grinding surface, the improvement which comprises:

rod means rotatably supported by said support means and being rotatable with said microtome knife carrier means about said pivot axis with respect to said support means;

slidable means so mounted on said rod means that the same is not allowed to rotate relative to said rod means but is allowed to move axially relative to said rod means;

first engaging means disposed on said slidable means;

at least two second engaging means disposed on said base structure, said first engaging means being adapted to engage selectively with one of said second engaging means thereby to enable said microtome knife carrier means to take at least two angular positions selectively; and

resilient means urging said slidable means and hence said first engaging means toward said second engaging means thereby to provide a tendency of said first engaging means to move into engagement with said second engaging means.

2. The improvement as claimed in claim 1 wherein said rod means is a pivot shaft extending outwardly from said support means along said pivot axis and supporting rigidly said knife carrier means, and wherein said slidable means is a sleeve extending on and along said pivot shaft, said pivot shaft having on one end thereof remote from said support means an enlarged portion of an outer diameter such that said sleeve may be slidably fitted thereon, said sleeve having a collar on the inner wall thereof at the end thereof adjacent said support means, whereby said pivot shaft and said sleeve are engaged with each with each other in coaxial relationship.

3. The improvement as claimed in claim 2 wherein said enlarged portion of said pivot shaft is further provided with a pin projecting radially outwardly therefrom, said sleeve being further provided with a longitudinal slot adjacent the end thereof corresponding to said enlarged portion, said pin being slidably engaged with said longitudinal slot whereby said sleeve can be slid axially relative to said pivot shaft without relative rotation therebetween.

4. The improvement as claimed in claim 2 wherein said first engaging means is a peg projecting from an arm extending radially outwardly from said sleeve at

the end thereof corresponding to the position of said collar, and said second engaging means are at least two depressions formed in the lateral surface of said support means facing said arm, said peg being adapted to engage selectively with any one of said depressions under the resilient force of said resilient means.

5. The improvement as claimed in claim 4 wherein one of said depressions is an arcuate groove formed along an arc having the center thereof on said pivot axis, said arcuate groove extending with an angular range such that, when said peg is in engagement therewith, said knife carrier means is within an angular range such that said microtome knife is in grinding contact with said grinding surface with a degree of freedom allowing said microtome knife to be swung about said pivot axis under its own weight.

6. The improvement as claimed in claim 2 wherein said resilient means is a coil spring extending between said enlarged portion of said pivot shaft and said collar of said sleeve and imposing resilient force upon said sleeve thereby to cause said first engaging means to be releasably engaged with any one of said second engaging means.

7. The improvement as claimed in claim 2 further comprising indicator means mounted on said support means and displacement transmitting means secured to said knife carrier means and extending to said indicator means to transmit the angular displacement of the carrier means to said indicator means.

8. The improvement as claimed in claim 7 wherein said transmitting means comprises a contact strap rigidly secured at one end thereof to said knife carrier means with the other end thereof extending for contact engagement with a sensing member of said indicator means in a fashion such that said contact strap can swing together with said knife carrier means and hence said microtome knife with respect to said pivot axis, whereby fine angular movements of said microtome knife with respect to said pivot axis are transmitted through said contact strap to said indicator means and sensed by the latter.

* * * * *

United States Patent

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[54] **KNIFE SHARPENING TOOL**

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[22] Filed: **Feb. 22, 1971**

[21] Appl. No.: **117,540**

[52] **U.S. Cl.**.....**51/109 BS,** 51/166 TS, 51/209 R

[51] **Int. Cl.**.....**B24b 3/54**

[58] **Field of Search**.....51/109 R, 109 BS, 166 R, 166 TS, 51/166 FB, 209 R, 210; 241/DIG. 17

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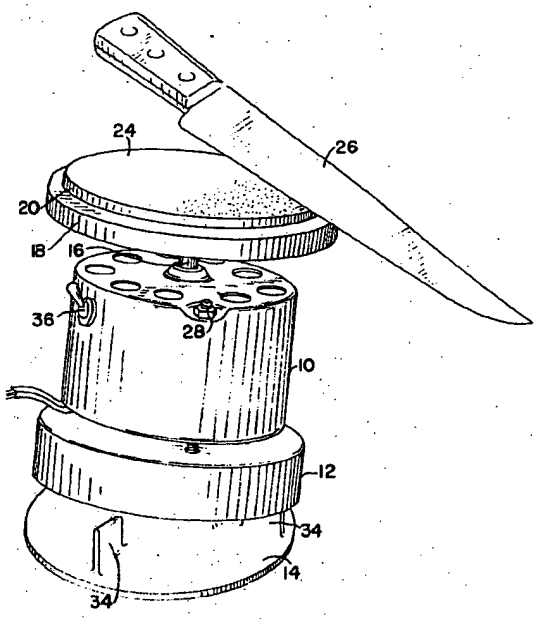
[57] **ABSTRACT**

A power driven tool for sharpening knives and similar cutting blades which is characterized by a driving motor arranged with its output shaft disposed vertically and carrying on its upper end a disc on the top face of which there is mounted a circular grinding plate or sheet, the motor being mounted on a supporting base member which in turn is mounted with a flexible connection on a suction cup for anchoring the tool on a supporting surface while permitting a limited amount of tilting from a normal upright position and having a degree of flexibility which insures return to the upright position when the tilting force is removed.

7 Claims, 5 Drawing Figures



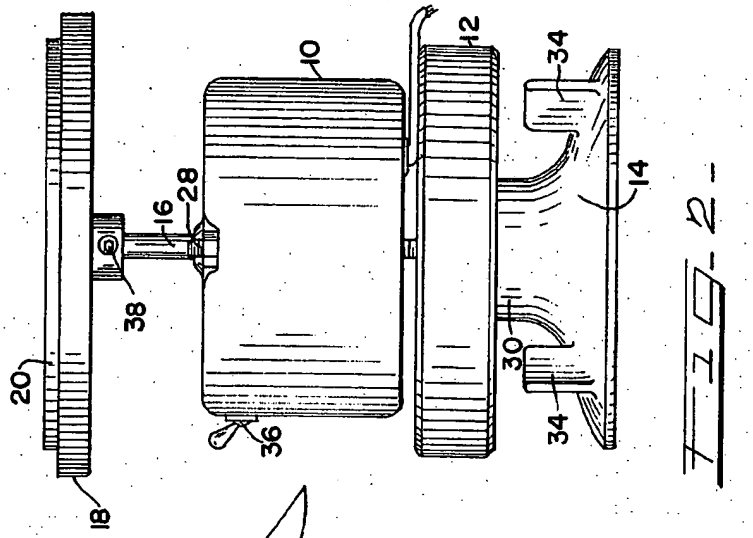


FIG. 2

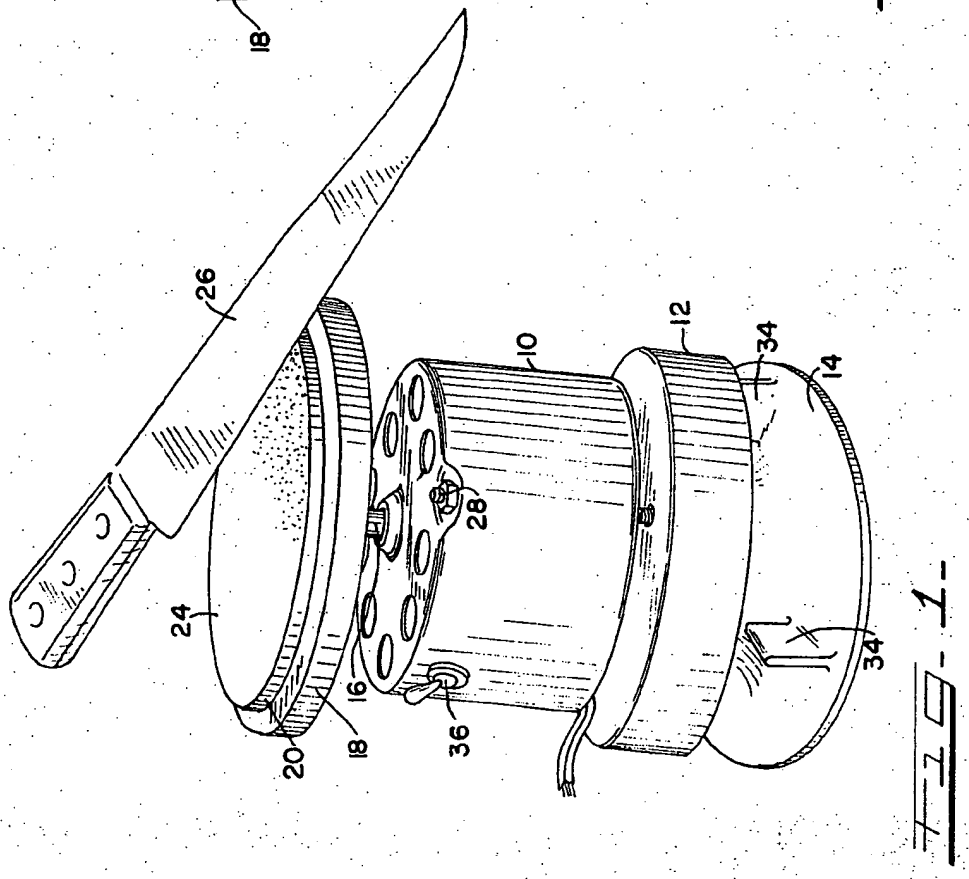


FIG. 1

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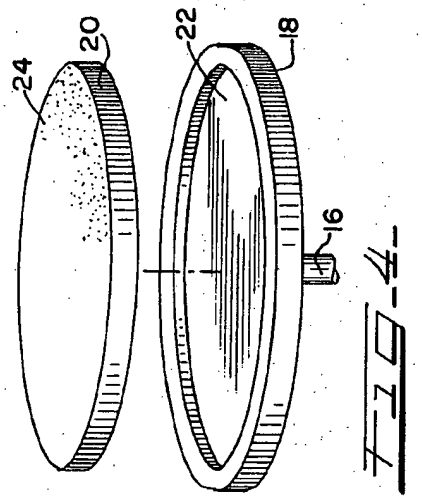

FIG. 4

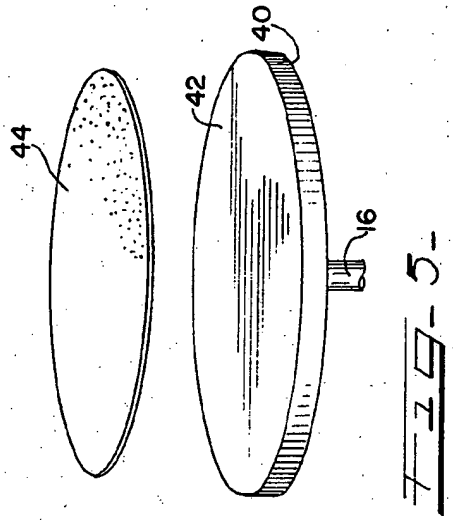

FIG. 5

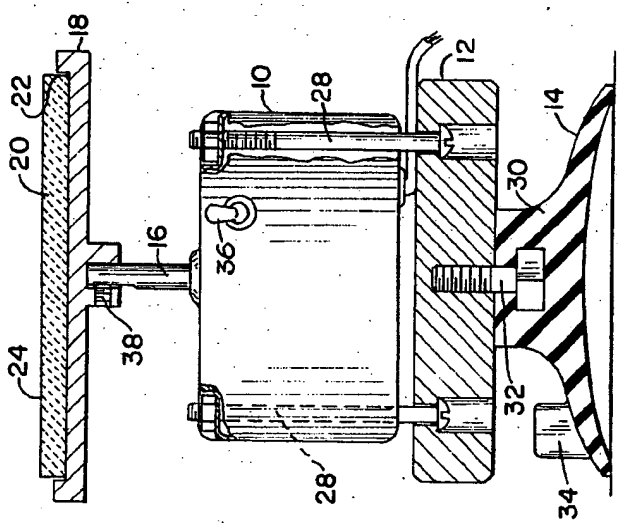

FIG. 3

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KNIFE SHARPENING TOOL

This invention relates to tools and is more particularly concerned with improvements in a tool which is especially useful for sharpening or grinding knife blades and similar objects.

Many tools have been designed which are adapted for various uses including the grinding or sharpening f knife blades and similar articles or objects. Generally, the tools which have been most commonly offered for such purposes have taken the form of power driven grinding wheels or disc elements which have included a rigid mounting, with the grinding element being rotated in a generally vertical plane and at a relatively high constant speed so that the operator has a limited range of visibility and a high degree of care must be exercised to avoid applying a pressure which will result in the removal of more than the desired amount of metal and to avoid too lengthy contact of the work with the grinding element which will result in damage by overheating. It is a general object of the present invention, therefore, to provide a sharpening tool for knives or similar objects which enables the user to better control the manner in which the object is engaged with the grinding element, which is more convenient to use, which is less hazardous to the user and less likely to damage the work than the tools heretofore provided for this and similar purposes.

A more specific object of the invention is to provide a sharpening or grinding tool for cutting blades and similar objects which is of relatively simple construction, which is sturdy and requires a minimum of maintenance, which has a relatively long life, and which may be economically produced.

Another object of the invention is to provide a sharpening or grinding tool for knives and similar articles which affords a high degree of safety for the user, which enables the user to readily control the amount of metal removed by the operation of the tool and which requires little skill for successful operation.

A further object of the invention is to provide a grinding tool which is automatically responsive to the force or pressure applied by the user in contacting the grinding face of the tool with the work piece so as to reduce to a minimum the risk of injury to the user and/or the work piece.

These and other objects and advantages will be apparent from a consideration of the knife sharpening tool which is shown by way of illustration in the accompanying drawings wherein:

FIG. 1 is a perspective view of a knife sharpening tool which embodies therein the principal features of the invention, the view showing the manner in which a knife blade may be engaged with the grinding surface of the tool;

FIG. 2 is a side elevation of the tool of FIG. 1;

FIG. 3 is a vertical cross section with parts in elevation;

FIG. 4 is an exploded perspective view showing the grinding disc and the support plate therefor; and

FIG. 5 is an exploded perspective view showing a modified grinding disc and support plate arrangement.

Referring to the drawings, there is illustrated a tool arrangement which embodies the invention and which is designed particularly for sharpening cutting blades, such as, butcher knives, pen knives, scissors and similar cutting devices where it is desirable to be able to clearly

observe the cutting operation and to exercise a high degree of control over the same in order to avoid injury to the operator in the use of the tool and to minimize the chances of damage to the work piece which could result due to an improper grinding angle, excessive pressure or other errors likely to be made by the operator when careful observation of the grinding action is difficult or impossible as in many tools heretofore provided for this purpose.

As shown in FIGS. 1 to 4, the tool comprises an electric drive motor 10 which is mounted on a base plate or support member 12, the latter being in the form of a short length of a solid cylinder, preferably of steel, or other metal, so as to afford a stable and normally rigid base. The base member 12 is in turn mounted on a suction cup device 14 for supporting the tool on a table, bench top, or other structure (not shown) which will afford a generally horizontal supporting surface. The motor 10 is arranged with its output or drive shaft 16 disposed vertically and carrying on its top end a cylindrical support plate or disc 18 which has a cylindrical grinding disc element 20 seated in a shallow circular recess 22 in the upper face of the support plate 18 with the top surface or face 24 of the disc 20 in a plane above the margin of the support member 18 where it is available for contact by a work piece which it is desired to sharpen, for example, the knife blade 26 which is illustrated in FIG. 1.

The motor 10 is a type which is commercially available such as, for example a 1/50 horse power split phase motor with a driving torque which will rotate the support plate 18 and grinding disc 20 at a suitable grinding speed for the disc 20 and which will decrease in speed or slow down upon the application of force or pressure exceeding a predetermined amount so as to give the user warning of power failure.

The motor 10 is rigidly connected to the base plate 12 by a pair of machine screws 28 as shown in FIG. 3 or other suitable fastening elements. The cylindrical base plate 12 is a relatively thick metal member of substantial weight so as to stabilize the device. It is connected on its bottom face to a neck forming base portion 30 of the suction cup 14 by bolt 32 or equivalent fastening means.

The suction cup 14 is formed of rubber-like material having a degree of resiliency so as to enable the neck portion 30 to flex under a vertical component of force which results from pressure applied to the top face 24 of the grinding element 20 which is effective at a point offset relative to the vertical axis and to return the grinding plate 20 to its normal position when the pressure is discontinued. The tilting effect which results due to the resiliency of the neck portion 30 of the suction cup 14 when downward pressure is applied to the grinding plate 20 is of limited extent, there being post-like stop members 34 upstanding in spaced relation around the margin or rim of the suction cup 14 which help prevent tipping the device over and breaking the hold of the suction cup on the supporting surface when the device is in use. A control switch 36 may be mounted in the motor assembly.

The plate or disc support 18 for the grinding element 20 is of rigid material and is fastened by a set screw 38 or the like to the top end of the motor drive shaft 16. The recess 22 in the top face is relatively shallow. Its

depth depends upon the thickness of the grinding disc 20 so as to enable the grinding disc 20 to seat in the recess, preferably, without the aid of any adhesive, thereby enabling the ready replacement of the disc whenever it is desirable to do so while at the same time retaining the disc during rotation of the support member 18 with the entire top grinding surface of the disc available, without obstruction, for contact by the edge of the blade. The grinding disc 18 may be, for example, any round abrasive disc product such as bonded resin or resin-rubber or sheet mix.

In using the illustrated tool for a grinding operation, such as the sharpening of a knife blade 26, the operator engages the knife edge on the top surface 24 of the rotating grinding disc 20, holding the blade at the proper angle relative to the face of the tool and applies pressure for a sufficient time, to remove the desired amount of metal, moving the blade 26 across the grinding surface as required for uniform sharpening of the edge. If too much pressure is applied the motor speed will decrease to the stalling point. This limits the amount of work the abrasive disc will do. In effect, the abrasive and the motor decide when they are in balance for effective grinding. There is nothing to interfere with moving the blade across the grinding surface. If the blade 26 is moved too far from the center of the grinding surface 24 and sufficient pressure applied, the plate 20 will tilt and the blade 26 will slide off the rim of the grinding surface. Since the grinding action may be readily observed by the operator, it is easy to judge the proper position and pressure to obtain the desired grinding action.

In a modified arrangement which is illustrated in FIG. 5, the support plate 40 is provided which has a planar top surface 42 for mounting thereon a paper or fabric backed grinding element 44. The grinding element 44, which is in the form of a disc having a suitable abrasive, may be secured on the surface 40 by any suitable adhesive, preferably a peelable type which will permit ready removal and replacement of the disc. Otherwise, the tool is the same as shown in FIG. 1 and operates in the same manner.

I claim:

1. A device for sharpening knife blades comprising a base forming plate member, a suction cup means for mounting the base forming plate member in a horizontal position, which suction cup means is connected to the underside of said base forming plate member by a portion thereof which provides a resilient support permitting tilting of said base forming member under vertical components of force when applied from above and outside the vertical axis, a drive motor mounted on said base forming plate member and having a drive shaft extending vertically, a disc-like support member mounted on said drive shaft for rotation when the motor is operated, said support member having means on its topmost surface for mounting a grinding disc whereby the grinding disc presents a top surface for unobstructed engagement by the knife blade, said support member being adapted to tilt when vertical pressure on the grinding disc is outside the vertical axis and exceeds a predetermined amount, the tilting action being resisted by the portion of the suction cup means connecting the suction cup and the base forming plate member.

2. A device for sharpening knife blades as set forth in claim 1 wherein said motor has a driving torque which results in a decrease in speed when excessive vertical pressure is exerted on the top surface of the grinding disc.

3. A power driven tool for sharpening knives comprising a base forming member, a means for mounting the base forming member in a generally horizontal position which mounting means is connected to said base forming member so as to provide a resilient support permitting tilting of said base forming member under vertical components of force when applied from above and outside the vertical axis, a motor mounted on said base forming member and having a drive shaft extending vertically and a disc member mounted on said drive shaft for supporting on its topmost surface a relatively thin grinding disc, said grinding disc having on its top an abrasive surface for engagement by the knife whereby said motor and grinding disc will tilt when pressure is exerted on the disc at a point outside the vertical axis and in excess of a predetermined amount, the tilting action being resisted by the resilient support for said base forming member.

4. A power driven tool as set forth in claim 3 wherein said means for mounting the base forming member comprises a suction cup secured in depending relation on the bottom of said base forming member by a connecting member which is resilient.

5. A power driven tool as set forth in claim 3 wherein said means for mounting the base forming member comprises a bottom section adapted to be detachably secured to a support and a connecting section which is resilient so as to permit limited tilting of said motor upon the application of a vertical component of force on said grinding disc in an area offset laterally from the vertical axis of said grinding disc.

6. A power driven tool as set forth in claim 3 wherein said disc member has a top surface with a relatively shallow recess therein for detachably mounting said grinding disc with the abrasive surface thereof uppermost and unobstructed so as to be wholly available for grinding operations.

7. A power driven tool for sharpening knives comprising a drive motor disposed with its drive shaft upstanding in a generally vertical position, a means for mounting said motor which is connected to and depends from the lower side thereof so as to provide a resilient support permitting tilting of said vertical shaft under vertical components of force when applied from above and outside the axis of said shaft, and a disc member mounted on said drive shaft and providing on its top an abrasive surface for engagement by the knife whereby said motor and disc member will tilt when pressure is exerted on the member at a point outside the vertical axis of said shaft and in excess of a predetermined amount, the tilting action being resisted by said resilient support, and said motor and said abrasive surface being such that the motor speed automatically adjusts to proper balance with the abrasive surface for effective grinding.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,680,264 Dated August 1, 1972

Inventor(s) Edward J. Dewitt

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

On the cover sheet, insert -- [73] Assignee Wallace Supplies Manufacturing Company, Chicago, Ill., a corp. of Illinois -- .

Signed and sealed this 19th day of December 1972.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents

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